

Limitations of charcoal as an effective carbon sink

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Fire-derived charcoal is thought to be an important carbon sink. However, a SLU paper in *Science* shows that charcoal promotes soil microbes and causes a large loss of soil carbon.

There has been greatly increasing attention given to the potential of 'biochar', or charcoal made from biological tissues (e.g., wood) to serve as a long term sink of carbon in the soil. This is because charcoal is carbon-rich and breaks down extremely slowly, persisting in soil for thousands of years.

This has led to the suggestion being seriously considered by policy makers worldwide that biochar could be produced in large quantities and stored in soils. This would in turn increase ecosystem carbon sequestration, and thereby counteract human induced increases in carbon-based greenhouse gases and help combat global warming.

However, a new study by Professors David Wardle, Marie-Charlotte Nilsson and Olle Zackrisson at SLU, the Swedish University of Agricultural Sciences, in Umeå, scheduled to appear in this Friday's issue of the prestigious journal *Science*, suggests that these supposed benefits of biochar may be somewhat overstated. In their study, charcoal was prepared and mixed with forest soil, and left in the soil in each of three contrasting forest stands in northern Sweden for ten years.

They found that when charcoal was mixed into humus, there was a substantial increase in soil microorganisms (bacteria and fungi). These

microbes carry out decomposition of organic matter (carbon) in the soil, and consistent with this, they found that charcoal caused greatly increased losses of native soil organic matter, and soil carbon, for each of the three forest stands. Much of this lost soil carbon would be released as carbon dioxide, a greenhouse gas. Therefore, while it is true that charcoal represents a long term sink of carbon because of its persistence, this effect is at least partially offset by the capacity of charcoal to greatly promote the loss of that carbon already present in the soil.

The study finds that the supposed benefits of biochar in increasing ecosystem carbon storage may be overstated, at least for boreal forest soils. The effect of biochar on the loss of carbon already in the soil needs to be better understood before it can be effectively applied as a tool to mitigate human-induced increases in carbon-based greenhouse gases.

Source: Swedish University of Agricultural Sciences

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